

# Linking Climate Change Vulnerability Assessment to Adaptation Strategy for Species, Ecosystems, and Landscapes



Patrick Comer, Chief Ecologist

Bruce Young, Director of Species Science

Patrick Crist, Director of Conservation Planning

# Climate Change Vulnerability Assessment and Adaptation Strategy



# Issues and Questions for this Session

- What do we need from vulnerability assessments to best inform adaptation strategies for biodiversity?
- Species: we cannot adequately assess all species individually
  - *What might be practical selection criteria to consider?*

# Issues and Questions for this Session

- Regions & Landscapes: We need sufficient specificity to inform strategies
  - *What types of strategies are well-informed by regional landscape assessment?*

# Issues and Questions for this Session

➤ For any given area, what might be a robust combination?

❖ Landscapes

❖ Communities

❖ Species

# Climate Change Vulnerability Assessment and Adaptation Strategy







# Lessons Learned from the Climate Change Vulnerability Index: The First Three Years

Bruce Young

[bruce\\_young@natureserve.org](mailto:bruce_young@natureserve.org)



# Thanks

## Co-developers

- Elizabeth Byers
- Kelly Gravuer
- Kim Hall
- Geoff Hammerson
- Alan Redding

## Users

- Elizabeth Byers
- Matt Schlessinger
- Kristin Szabo



# Desktop: Excel

CCVI\_release\_2.1.xlsm - Microsoft Excel

Home Insert Page Layout Formulas Data Review View

C4

**The NatureServe Climate Change Vulnerability Index**

**Release 2.1** 7 April 2011; Bruce Young, Elizabeth Byers, Kelly Gravuer, Kim Hall, Geoff Hammerson, Alan Redder  
With input from: Jay Cordeiro, Kristin Szabo

Funding for Release 2.0 generously provided by the Duke Energy Corporation.

\* = Required field

Geographic Area Assessed: \*

Assessor:

Species Scientific Name: \*

English Name:

Major Taxonomic Group:

Clear Form

Index: [www.natureserve.org/climatechange](http://www.natureserve.org/climatechange)

Online: adapt.nd.edu

hub

CCVI Notebook

Home Section A Section B Section C Section D Section Result Database Access Existing Feedback

**The NatureServe Change Vulnerability Index**

**Release 2.1** © 7 April 2011; Bruce Young, Elizabeth Byers, Kelly Gravuer, Kim Hall, Geoff Hammerson, Alan Redder  
With input from: Jay Cordeiro, Kristin Szabo  
Funding for Release 2.0 generously provided by the Duke Energy Corporation.

Web Tool Iteration 2.0

\* = Required Field

Geographic Area Assessed: \*

Assessment Name: \*

Assessor: Bruce Young 84

Species Scientific Name: \*

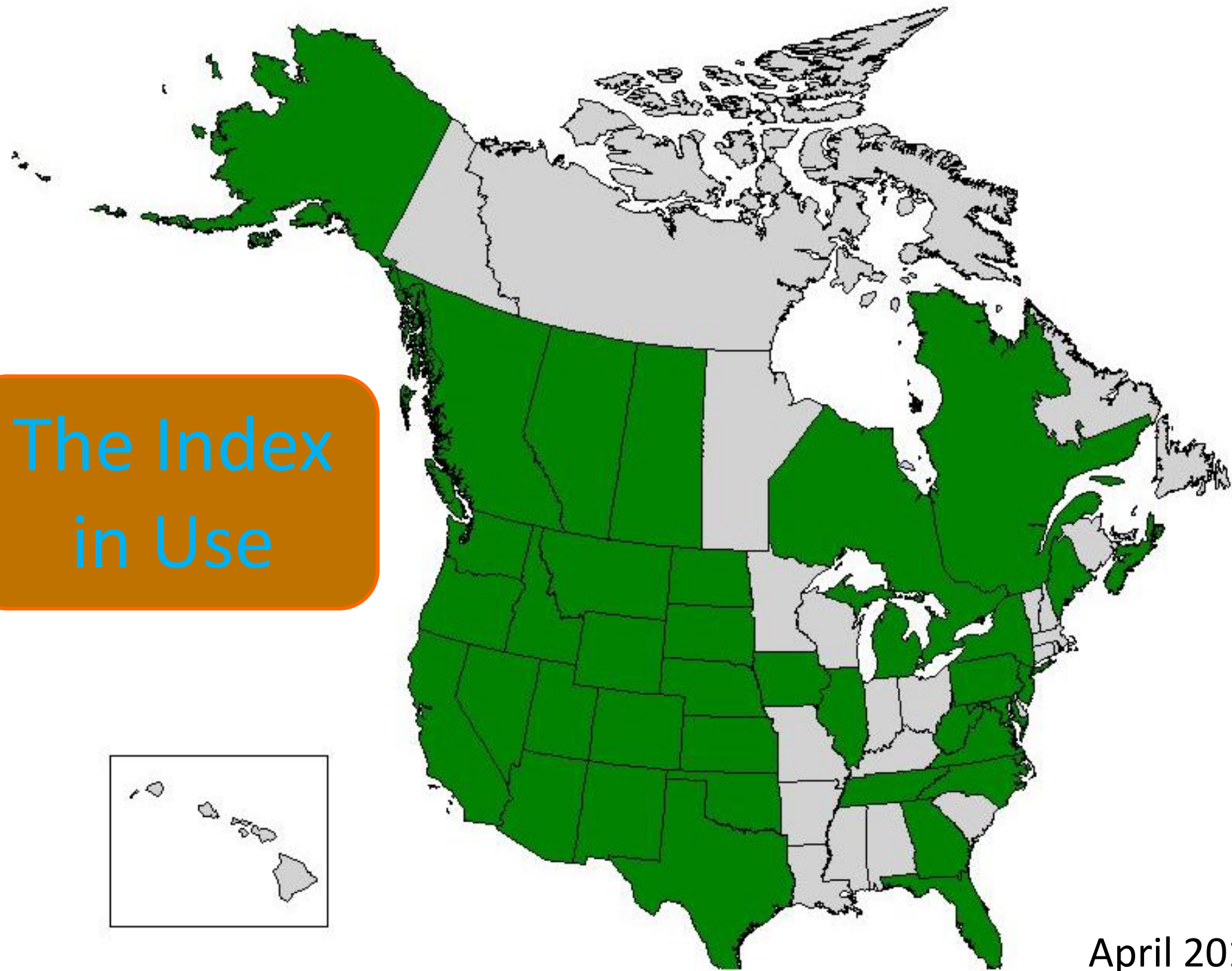
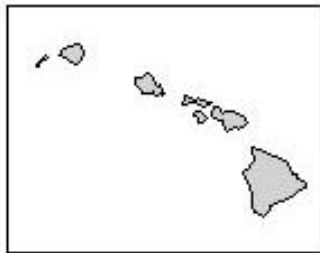
English Name:

Major Taxonomic Group: \*

States: ☐ Alabama ☐ Alaska ☐ Arizona

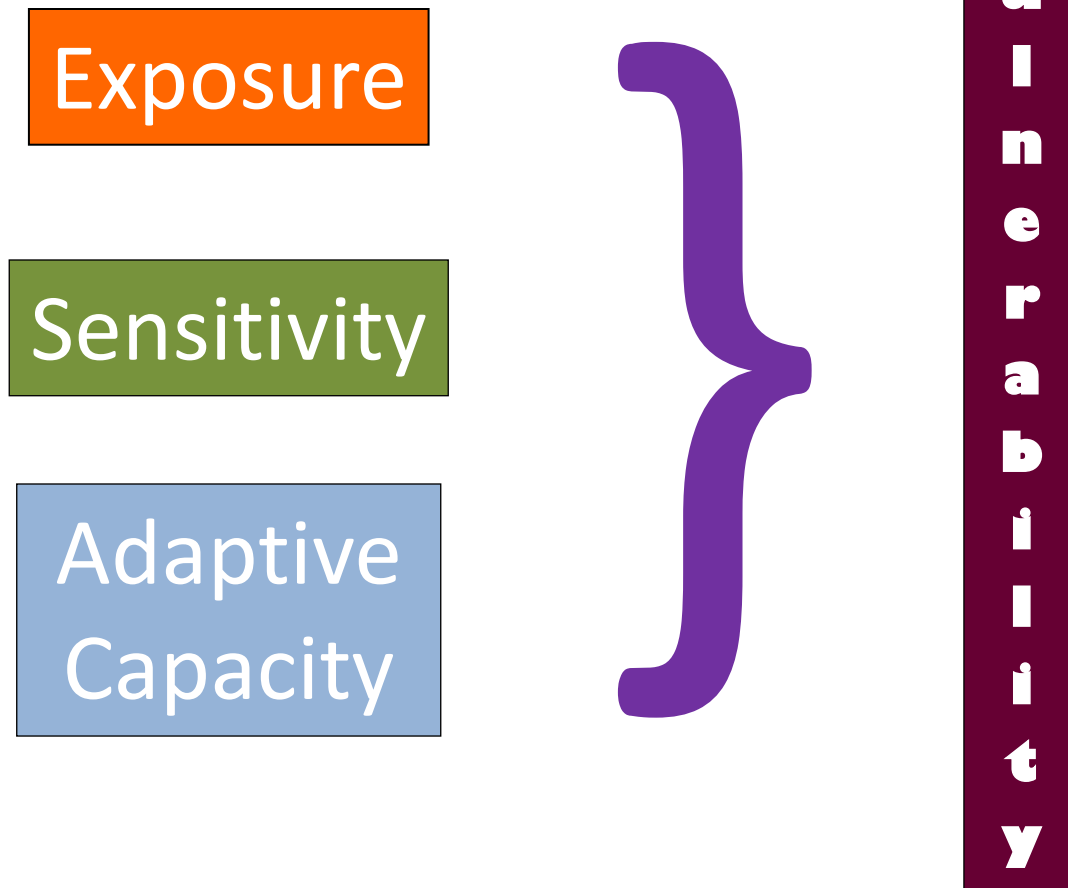
G-Bank: S-Bank:

The Index  
in Use




April 2012

# Lesson #1: The CCVI Helps Teach the Basics about Climate Change & Vulnerability




# Index Scores

	Extremely Vulnerable
	Highly Vulnerable
	Moderately Vulnerable
	Not Vulnerable/Presumed Stable
	Not Vulnerable/Increase Likely
	Insufficient Evidence

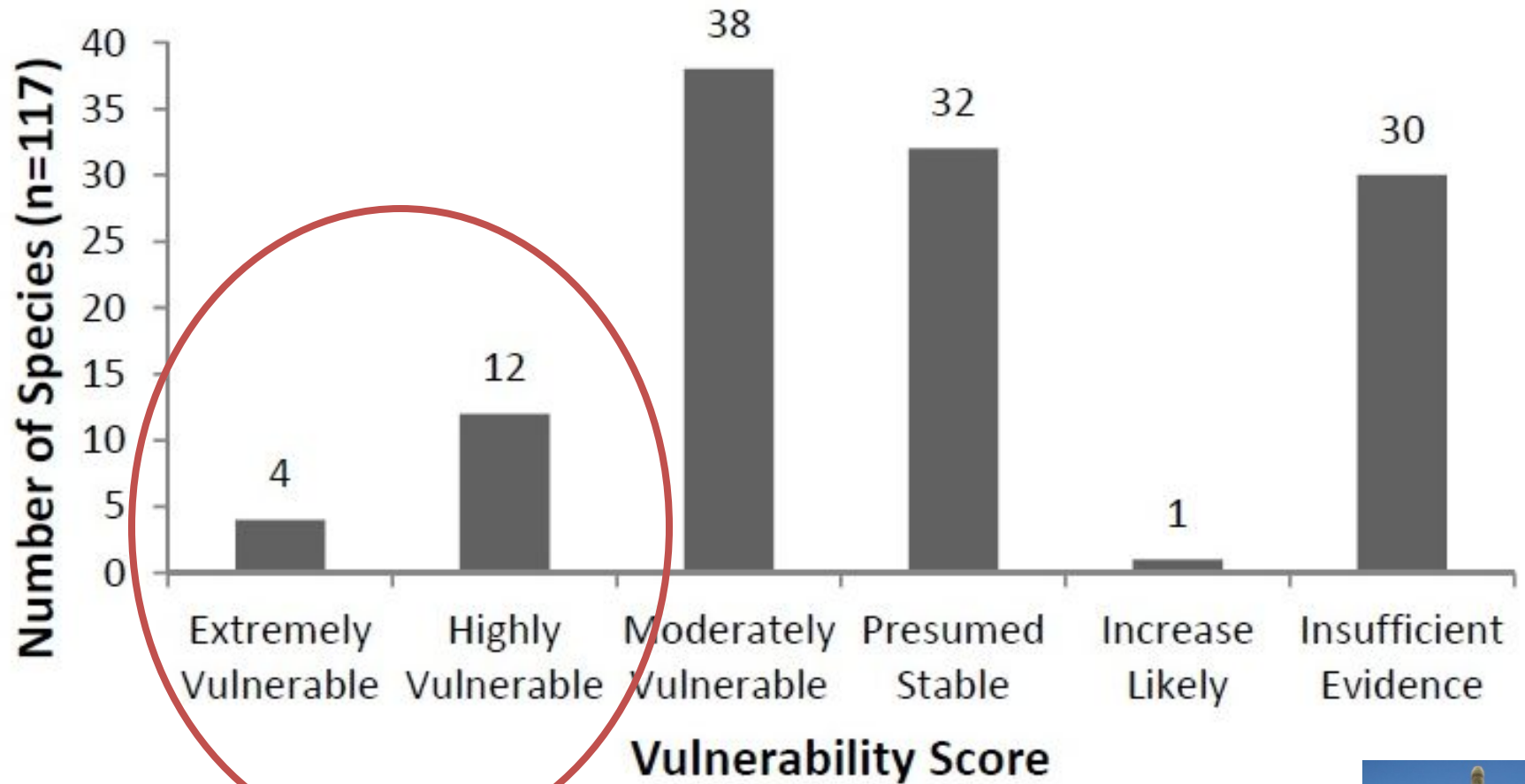


# Factor Results

<div>NatureServe</div>																								
	Natl barriers	Anth barriers	CC mitigation	Dispersal/Movement	historical thermal niche	physiological thermal niche	historical hydrological niche	physiological hydrological niche	Disturbance	Ice/snow	Phys habitat	Other spp for hab	Diet	Pollinators	Other spp disp	Other spp interaction	Genetic var	Gen bottleneck	Phenol response	Doc response	Modeled change	Modeled overlap	Protected Areas	
Species	B2a	B2b	B3	C1	C2ai	C2aii	C2bi	C2bii	C2c	C2d	C3	C4a	C4b	C4c	C4d	C4e	C5a	C5b	C6	D1	D2	D3	D4	
<i>Sclerocactus glaucus</i>	N	N	SI	SI-N	N	N	SD	N	N	SI-N	N	N	N/A	SI	N	N	SI	N/A	U	U	U	U	U	
<i>Sclerocactus intertextus</i>	SI	SI	Inc	N	N	N	Inc	SI	N	N	SI	N	N/A	SI	N	U	U	N	U	U	U	U	U	
<i>Sclerocactus johnsonii</i>	N	N	Inc	N	N	N	SI	SI	N	N	SI	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus mesae-verdae</i>	SI	N	SI	N	N	N	GI	SI	N	N	N	N	N/A	N	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus nvensis</i>	N	N	SI	N	N	N	Inc	SI	N	N	N	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus papyracanthus</i>	SI	N	Inc	N	N	N	SI	SI	N	N	N	N	N/A	SI	N	N	U	SI-N	U	U	U	U	U	
<i>Sclerocactus parviflorus</i>	Inc	N	SI	N	N	N	SI	SI	N	N	N	N	N/A	SI	N	N	SI-N	N/A	U	U	U	U	U	
<i>Sclerocactus polyancistrus</i>	SI	N	Inc	N	N	N	Inc-SI	SI	N	N	N	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus pubispinus</i>	N	N	SI	N	N	N	SI	SI	N	N	N	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus sileri</i>	SI	N	Inc	N	N	N	N	SI	N	N	N	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus spinosior</i>	SI	SI	Inc	N	N	N	N	SI	N	N	SI	N	N/A	SI	U	U	U	U	U	U	U	U	U	
<i>Sclerocactus uncinatus</i>	N	N	Inc	N	N	N	SI	SI	N	N	SI-N	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus wetlandicus</i>	Inc	N	SI	N	N	N	N	SI	N	N	N	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus whipplei</i>	SI	N	SI	N	N	N	Inc	SI	N	N	N	N	N/A	SI	N	N	U	U	U	U	U	U	U	
<i>Sclerocactus wrightiae</i>	N	Inc	SI	Inc	N	N	GI	SI	N	N	SI	N	N/A	SI	N	N	U	U	SI	U	U	U	U	
<i>Stenocereus thurberi</i>	Inc	SI	Inc	N	N	N	SI	SI	U	N	N	SI	N/A	N	N	N	U	U	U	U	U	U	U	

Lesson #2: Pay Attention to the Factor Scores





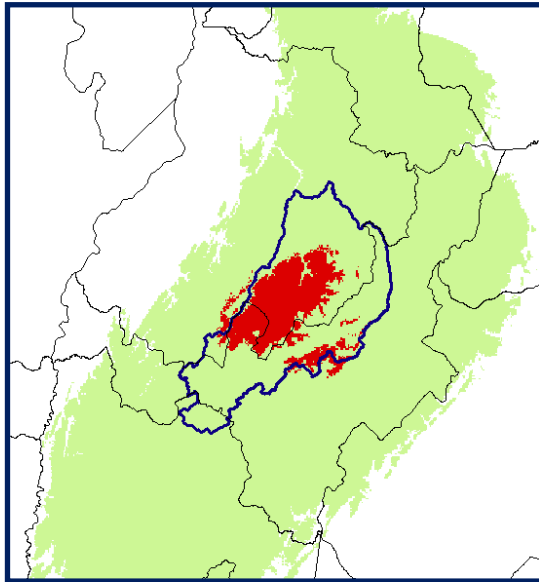
Cactus Species Occurring on BLM Lands



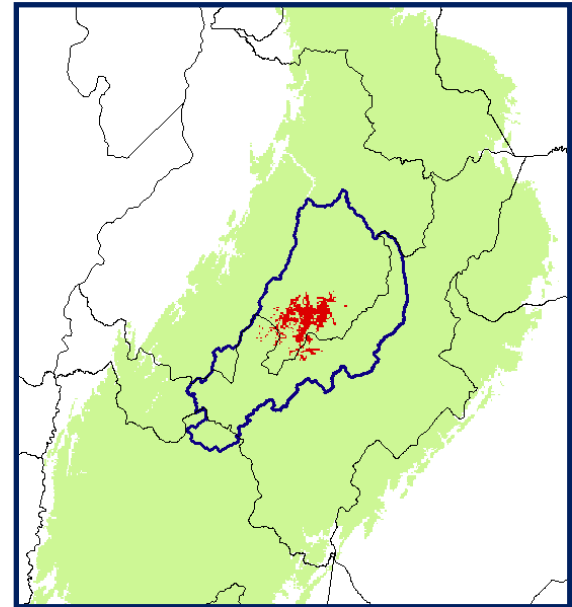


# Next Step: Spatial Insights

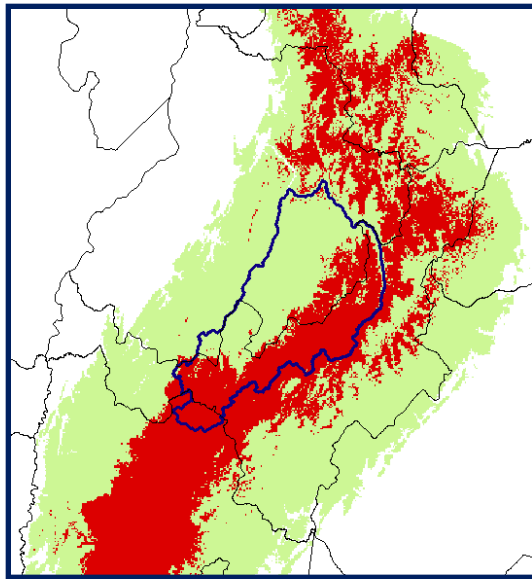
Current Distribution



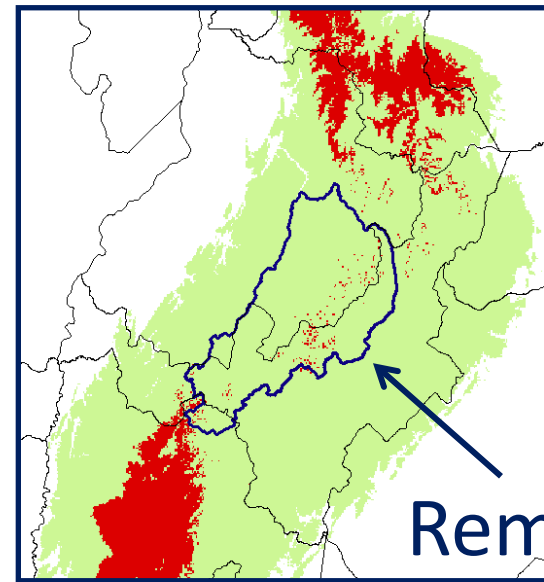
Predicted Future  
Distribution



*Mecocerculus  
leucophrys*



Current



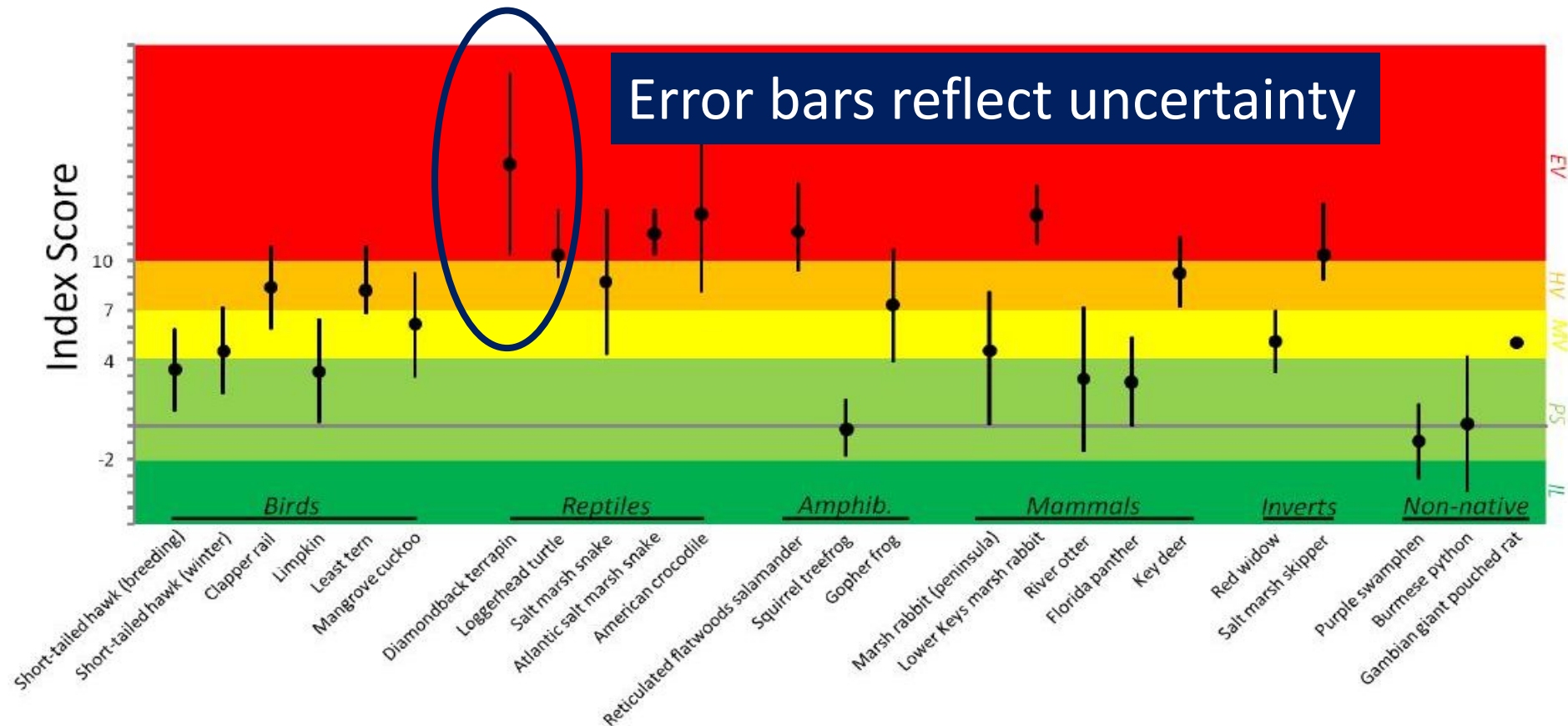
Predicted Future

**BUT** ... This species scored Not Vulnerable

## Lesson #3: Combine Trait & Spatial Approaches

## Lesson #4: Screen with Trait Data, then Model

# Florida: 24 species



Climate Change Vulnerability Index for <i>Carnegiea gigantea</i> in Arizona			
No B3:	Moderately Vulnerable	<b>Confidence in Species Information</b> Moderate <small>* Histogram below</small>	Copy Data to Results Table Index score with B3 included: Highly Vulnerable
Notes:			
<b>Definitions of Index Values</b> <u>Extremely Vulnerable (EV)</u> : Abundance and/or range extent within geographical area assessed extremely likely to substantially decrease or disappear by 2050. <u>Highly Vulnerable (HV)</u> : Abundance and/or range extent within geographical area assessed likely to decrease significantly by 2050. <u>Moderately Vulnerable (MV)</u> : Abundance and/or range extent within geographical area assessed likely to decrease by 2050. <u>Not Vulnerable/Presumed Stable (PS)</u> : Available evidence does not suggest that abundance and/or range extent within the geographical area assessed will change (increase/decrease) substantially by 2050. Actual range boundaries may change. <u>Not Vulnerable/Increase Likely (IL)</u> : Available evidence suggests that abundance and/or range extent within geographical area assessed is likely to increase by 2050. <u>Insufficient Evidence (IE)</u> : Available information about a species' vulnerability is inadequate to calculate an Index score.			

*Modification for project with the Bureau for Land Management*

## Lesson #5: Support Creativity to Address Users' Needs

# Use of CCVI Results in Nevada



WESTERN  
GOVERNORS'  
ASSOCIATION

*Serving the Governors of 19 States and 3 US-Flag Pacific Islands*



## And in West Virginia

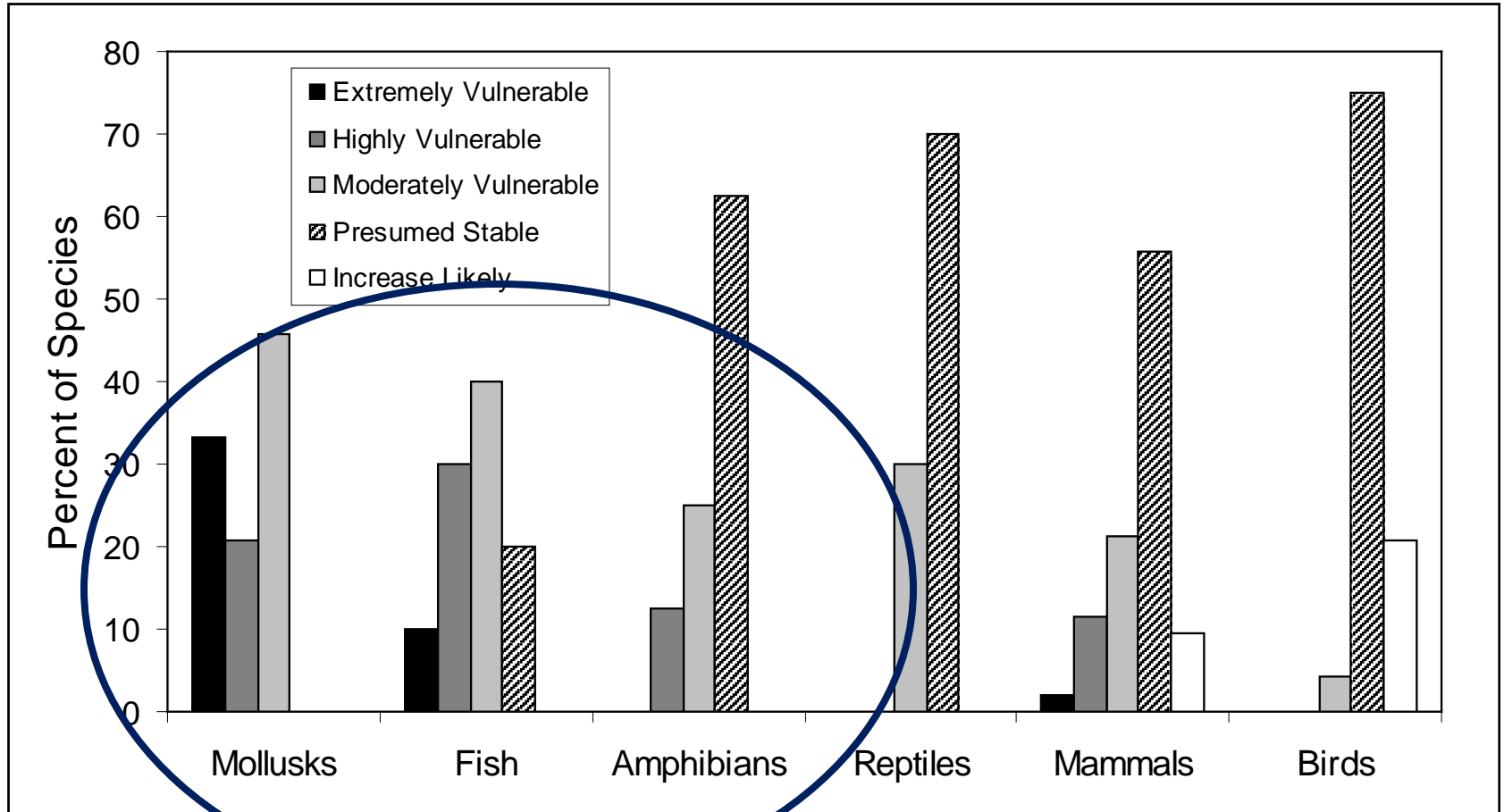


Central Appalachians  
Vulnerability Assessment -  
Climate Change Response  
Framework

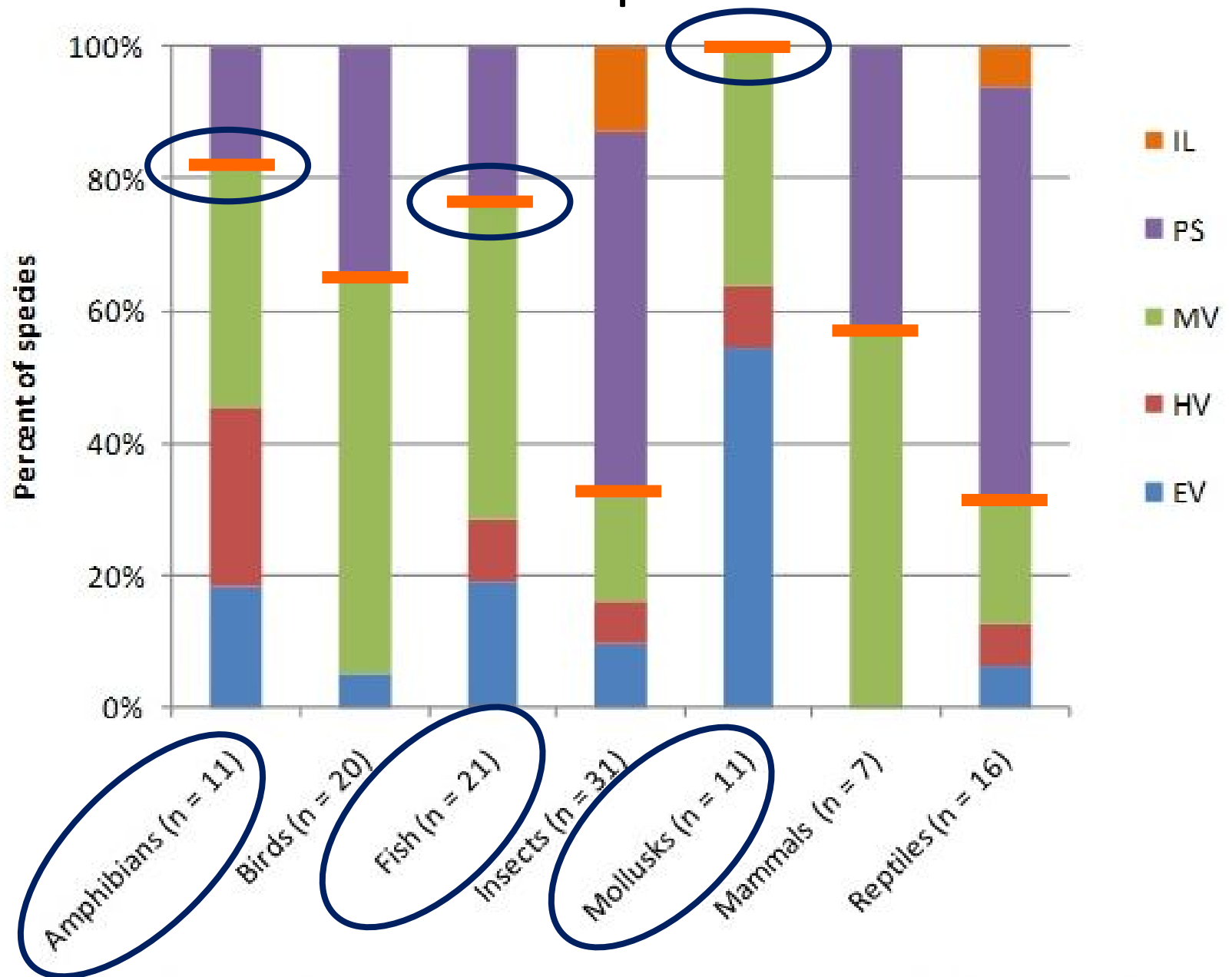
**Lesson #6:** CCVI Results Can Support  
Numerous Adaptation Processes



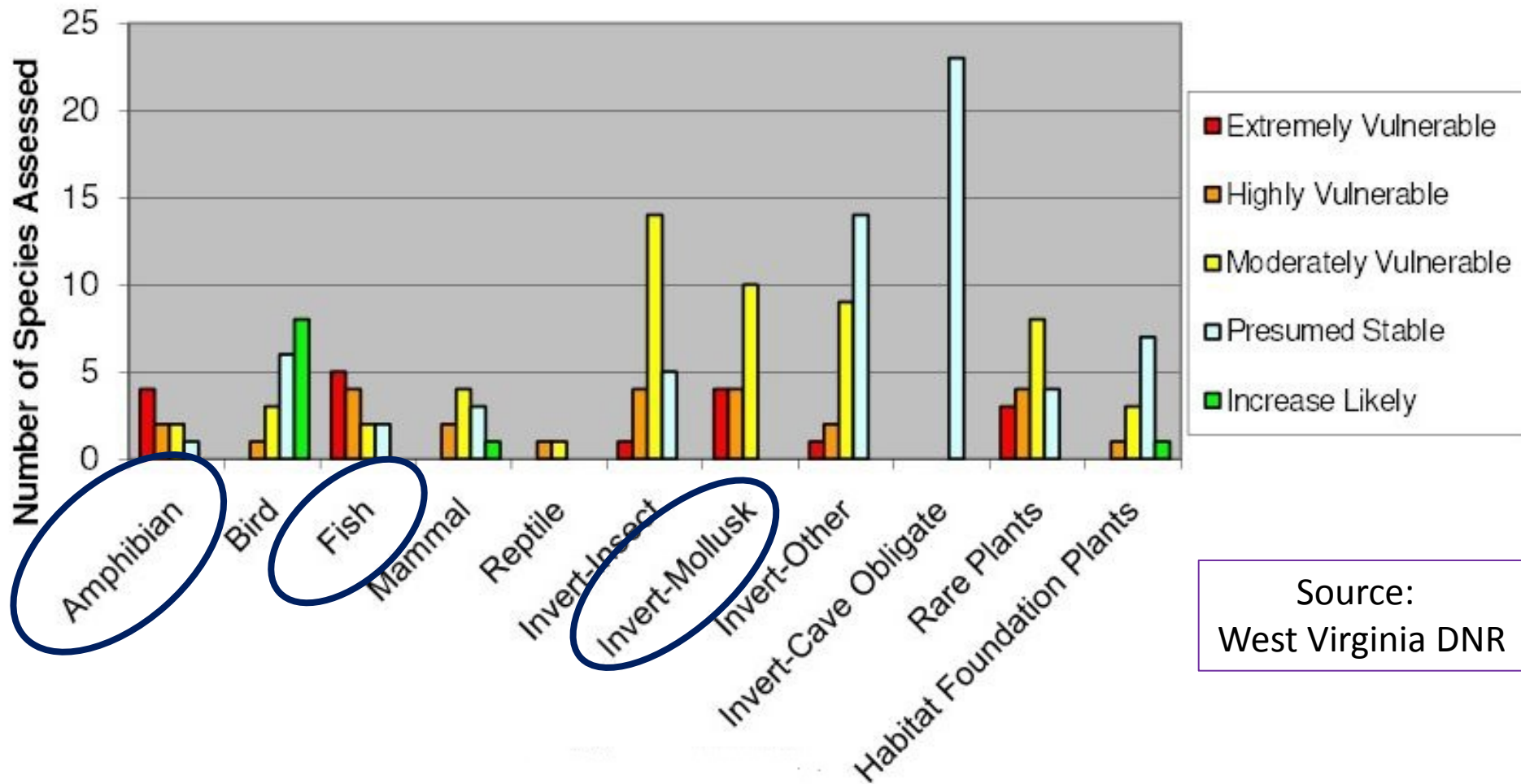
# Nevada: 216 Species



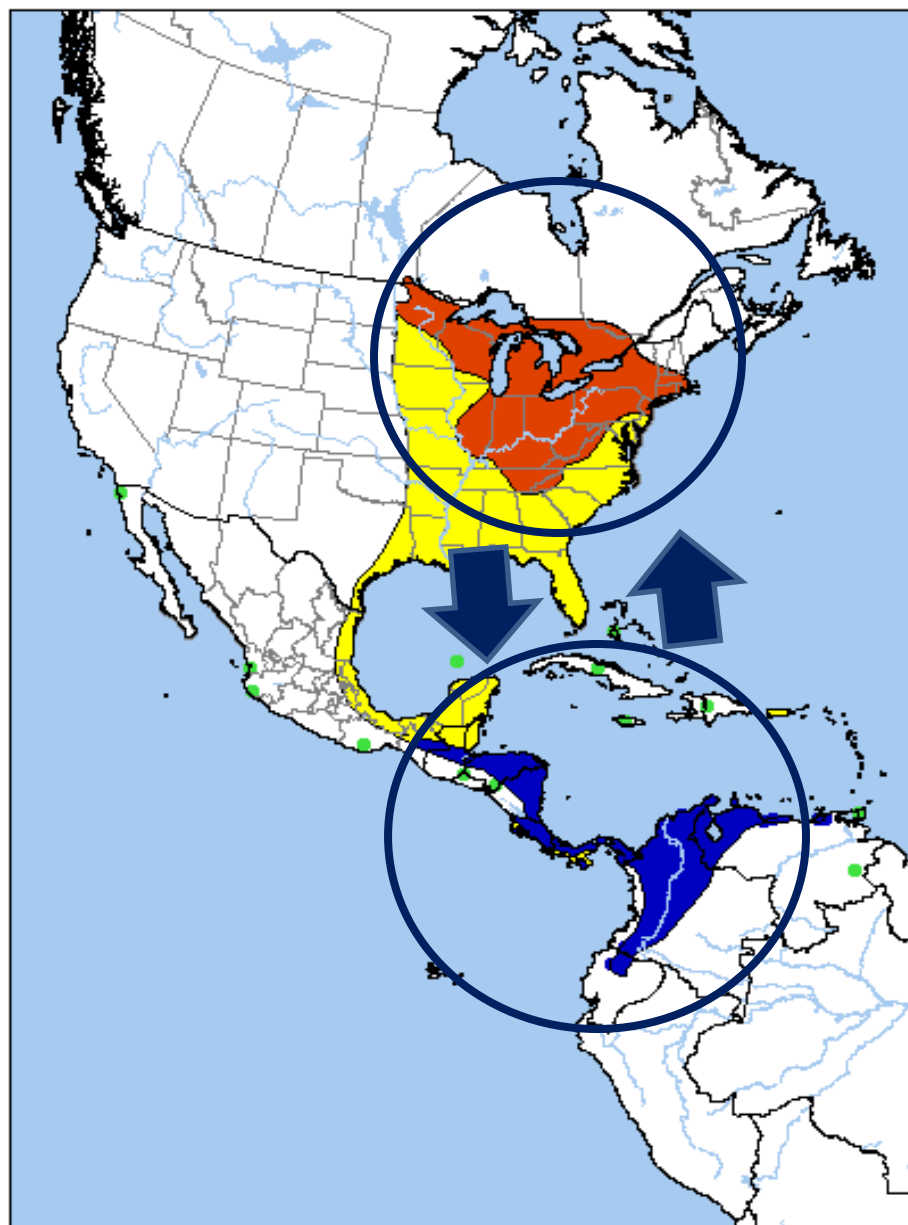
# New York: 117 species



# West Virginia: 185 species



**Lesson #7:** Aquatic species tend to be vulnerable



750 0 750 Kilometers



© Michael Patrikeev

- Permanent Resident
- Breeding Resident
- Nonbreeding Resident
- Passage Migrant
- Uncertain Status
- Introduced
- Vagrant
- ▨ Extirpated
- ▨ Historical Records Only
- National boundary
- Subnational boundary
- River
- Water body



Map created September 2007

# Lesson #8: Migratory Species Require Special Consideration

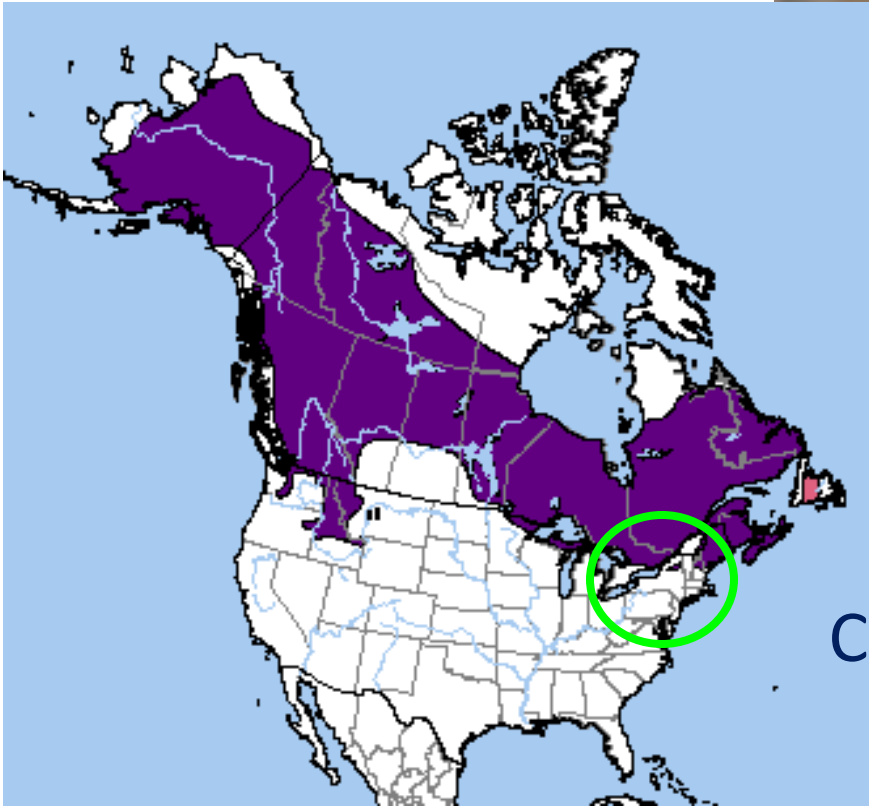
Focus on vulnerability within assessment area

or

Factor in effects of climate exposure on non-assessed migratory area

## Spruce Grouse

<http://www.snydersgrousepark.com>



CCVI Score (NY): Highly Vulnerable

**Lesson #9:** Some Results May be Unpopular



# Summing Up

- Growing database of CCVI results
- CCVI results are useful in many adaptation contexts
- Useful in combination with other tools
- Future version to offer more options for migratory species

**[bruce\\_young@natureserve.org](mailto:bruce_young@natureserve.org)**  
**[www.natureserve.org/climatechange](http://www.natureserve.org/climatechange)**